ATTACHMENT E
MFA DRILLING SOP

SAFETY GUIDELINES FOR DRILLING INTO SOIL AND ROCKS USING A HOLLOW STEM AUGER DRILL RIG

PURPOSE

The purpose of this Standard Operating Procedure (SOP) List to provide an overview for working safely around hollow stem drilling operations. It is to be used only in conjunction with the site-specific Health and Safety Plan (HSP).

This SOP addresses MFA employee's responsibility and authority for overseeing the use of safe work practices during drilling operations. The SOP also includes safety guidelines for:

- Drill rig mobilization and set-up.
- Clearing overhead lines, buried utilities and work area.
- Safety considerations with the use of auger drilling operations and activities.
- Roadside drilling and traffic.
- Personal protective gear.
- Drilling tools and downhole equipment.
- Fire safety.

APPLICATION

The guidelines will be applied to Maul Foster & Alongi (MFA) projects in which drilling activities are used. The guidelines are only applicable to MFA employees.

RESPONSIBILITY AND AUTHORITY

MFA field personnel are responsible for reviewing the site health and safety plan before the start of work activities. Drilling subcontractors are responsible for the safe operation of the drill rig, and the safety of their personnel.

SAFETY GUIDELINES

Drill Rig Mobilization and Set-up

The following guidelines should be considered when drilling equipment is mobilized:

- Drilling equipment, tools and materials must be secured.
- When moving between multiple drilling locations, the drill mast should be lowered and secured. Exceptions maybe granted if the distance between holes is small and the terrain flat.

- To the extent practical, walk the planned route of travel with the drill operator and inspect it for depressions, gullies, ruts, and other obstacles.
- Appropriate driving speeds should be maintained when driving on-site. This includes the use of forklifts, and all-terrain vehicles.
- A spotter should be used when the drill rig is backed-up, pulling on to a busy roadway, in the vicinity of overhead lines, and/or maneuvering in tight spaces.
- No passengers should accompany the drill rig or support truck when moving on variable terrain where rough, steep or soft conditions exist.
- Driving drill rigs along hillsides or embankments should be avoided; however, if hillside travel becomes necessary, the operator must conservatively evaluate the ability of the rig to remain upright.

When setting up a drill rig over a drilling location, the following conditions should be considered:

- Potential drilling locations should be okayed by the client or facility personnel.
- Drilling locations should be cleared of underground utilities and overhead lines by a professional utility locator. The utility locator should indicate that the location has been approved by physically marking it (see underground utilities and overheads lines).
- After the rig has been positioned to begin drilling, all brakes and/or locks must be set before drilling begins. If the rig is positioned on a steep grade and leveling of the ground is impossible or impractical, the wheel of the transport vehicle should be blocked and/or other means should be used to prevent the rig from moving.
- A minimum 8-foot by 8-foot workspace area should exist around the borehole and the back of the drill rig. Drill operators should have clear access to enter or exit the work area.
- Appropriate traffic cones should be placed in the front and rear drill rig (see traffic).
- MFA employees should maintain tidy and organized work areas during drilling activities. Obstacles in the work area should be removed or marked. Drilling materials should be placed on level ground and not restrict access to the drill rig.
- MFA employees should be wary of slip hazards caused by wet drill cuttings and/or rain.
- Open boreholes should be covered to prevent tripping hazards. Abandoned boreholes should be completed with at least 2-feet of loose gravel, cement or asphalt. Appropriate amounts of bentonite or grout should be used to prevent mounding or caving at the surface.

UNDERGROUND UTILITIES AND OVERHEAD LINES

- The location of overhead and buried utility lines must be determined before drilling begins, and the locations should be noted on boring plans and/or assignment sheets. Potential borehole locations should be okayed by the client or site-personnel. A public and/or private utility locator should be used to clear all boring locations of underground utilities and overhead lines. In cases where the underground utility line is in question, MFA employees should carefully advance a hand auger to at least 5-feet below ground surface as a precaution.

- When overhead power lines are close by, the drill rig mast should not be raised unless the distance between the rig and the nearest power line is at least 20 feet away. The drill rig operator or assistant should walk completely around the rig to make sure that proper distances exist.

- When the drill rig is positioned near an overhead line, the rig operator should be aware of swaying hoist lines and/or power lines contacting each other during windy conditions. When necessary and approved by the Project Manager (PM), the utility and/or overhead lines may be shielded, deactivated, or moved by the appropriate agency or personnel.

SAFE USE OF AUGERS AND WINCH LINES

- Auger flights should be stacked on wood blocks or drill rod before, during and after drill activities.

- Use care when lifting auger flights that are caked with clay or cuttings. Auger flights can be extremely heavy and awkward. Moving and handling of auger flights should be completed two people.

- Never place hands or fingers under the bottom of an auger flight or drill rods when hoisting them over the top of another auger or rod, or other hard surfaces, such as the drill rig platform. Never allow feet to get under the auger or drill rod while they are being hoisted.

- When the drill is rotating or advancing, stay clear of the drill string and other moving components of the drill rig. Never reach behind or around a rotating auger or moving drill string for any reason. MFA employees should never approach the auger string unless the transmission is in neutral or the engine is off, and the augers have stopped rotating.

- Move auger cuttings away from the auger with a long-handled shovel or spade; never use hands or feet.

- Never clean an auger attached to the drill rig unless the transmission is in neutral or the engine is off, and the auger has stopped rotating.

- Power washing or steam cleaning auger flights should be conducted by personnel using protective eye ware and rain suites at a minimum.

- Attention to safety should be given when pulling augers from the borehole with the main winch line or top head. In cases where the winch line or top head is being used to pull downhole auger flights that are locked in place, the drilling area should be cleared of all personnel except for the drill operator.
- Winch lines and sand lines should be properly secured when not being used. MFA employees should note the condition of the winch lines (i.e., fraying, spliced sections).
- Drill rod strings should be secured using the mast cage or placed on blocks on the ground. The length of the drill rod strings should not exceed the mast height (typically 40-feet).

SAFE USE OF HAND TOOLS

OSHA regulations regarding hand tools should be observed in addition to the guidelines provided below:

- Each tool should be used only to perform tasks for which it was originally designed.
- Damaged tools should be repaired before use or discarded.
- Safety goggles or glasses should be worn when using a hammer or chisel. Nearby co-workers and by-standers should be required to wear safety goggles or glasses also, or move away.
- Tools should be kept cleaned and stored in an orderly manner when not in use.

PROTECTIVE GEAR

Minimum Protective Gear

Items listed below should be worn by all members of the drilling team while engaged in drilling activities.

- Hard Hat
- Safety Shoes (shoes or boots with steel toes and shanks)
- Gloves
- Safety Glasses
- Hearing Protection

Other Gear

Items listed below should be worn when conditions warrant their use. Some of the conditions are listed after each item.

- **Respirator for Dust:** When working with materials that produce particulate matter such as silica sand or cement grout, the appropriate respirator should be used.

- **Safety Harnesses and Lifelines:** Safety harnesses and lifelines shall be worn by all persons working on top of an elevated derrick beam or mast. The lifeline should be secured at a position that will allow a person to fall no more than six feet. OSHA Full Protection (1926 Subpart m) requirements apply.

- **Life Vests:** Use for work over water.

TRAFFIC SAFETY

Drilling in streets, parking lots or other areas of vehicular traffic requires definition of the work zones with cones, warning tape, etc. and compliance with local police requirements. A minimum buffer should be established around the drilling area that is conducive to a safe work environment.

FIRE SAFETY

- Fire extinguishers shall be kept on or near drill rigs for fighting small fires.

- If methane is suspected in the area, a combustible gas instrument (CGI) shall be used to monitor the air near the borehole with all work to stop at 10 percent of the Lower Explosive Limit (LEL).

- Work shall stop during lightning storms.